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DOC	59	REV DATE	29 MAY 1980	BY	018323
ORIG COMP	56	LAI	56	TYPE	03
ORIG CLASS	M	PAGES	4	REV ELKS	C
JUST	22	NEXT REV	2010	AUTH	NR 10-2

ORIGINAL CL BY 235979
☐ DECL ☒ REVW ON 2010
 EXT BYND 6 YRS BY SAME
 REASON 32(3)

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PROGRESS REPORT**ON****4th ROCKET****FOR****MARCH 1955****28 April 1955****CONFIDENTIAL**

During the month of March additional rocket units were fabricated and test fired with revisions in manufacture and design made where results of previous tests indicated the necessity of changes.

The first series of test units fired during the month consisted of four units, three of which were designed to travel for a distance of approximately 500 yards. The fourth unit was made from parts of a unit which was fired successfully on three previous occasions. This unit employed the straight motor tube with nozzle canted at 15°. Its range was estimated to be somewhat greater than the other three models because of its smaller cross-sectional area and lesser resultant drag.

The first unit fired was the straight tube model with canted nozzles. This unit ignited satisfactorily and flew for an estimated 700 yards. The angle of deviation was estimated to be 15° left of the launching direction.

The second unit fired employed motor tubes canted at 15° with straight nozzles. This unit ignited satisfactorily and flew for approximately 450 yards. Stability seemed to be good. Flight time was measured at 10.2 seconds. The angle of deviation was only 1 or 2° to the right of the launching direction.

The third unit tested was constructed in the same way as the second with canted motor tubes. When fired this unit flew for 490 yards. Stability appeared to be good and the unit landed nose first. The time of flight was measured to be 10.2 seconds.

The fourth unit fired was made up in the same way as the second and third units. When fired it traveled 445 yards. Its stability seemed to be good and it landed nose first. The flight time was measured at 9.8 seconds.

It is interesting to note that units #2, #3 and #4 all landed with in a 50 yard radius circle. This accuracy is considered excellent in view of the poor fit of the missiles within the improvised launching tube.

The second series of tests consisted of three units. Two of these units were designed to travel for 2000 to 2500 yards. The third unit was of the short range variety but equipped with a time delay train, burster charge, and a pay load.

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had been previously used many times with these two head pieces and it must be assumed that constant reuse caused a weakening to the point that they could not withstand the combination of pressure and increased set back force.

The second unit tested had been previously fired successfully in an earlier series of tests and was equipped with an 8 second time delay (Bickford fuse), a burster charge of A-1 black powder and a pay load. When fired, this unit lost a nozzle and chuffed out. The delay train and burster charge functioned properly and scattered the payload over a wide area although the burster charge exploded on the ground.

The third unit in this series consisted of six canted motor tubes each ten inches long and each containing six powder grains eight inches long. The nozzles had a throat diameter of 0.425 inches. When fired, this unit failed because all six motor tubes were blown out of the head. The head, itself, was a reclaimed piece and in preparing the holes for the motor tubes they were somewhat enlarged. This caused a potting action on the tubes rather than bonding. It was noted before gluing that each motor tube fit very loosely in its respective hole.

The next series of tests consisted of four units. Two of the units were of the short range variety. Each had been fired successfully on a previous occasion. Both units were equipped with Bickford fuse delay trains cut for 8 seconds. Both contained burster charges and a payload.

The first of these two units was ignited and failed when one of the motor tubes burned through and broke off. The unit became jammed in the launcher and after a delay of approximately 8 to 10 seconds the burster charge exploded rupturing the launcher tube.

The second of these units was launched from the two foot portion of the launcher which remained intact, and flew for approximately 420 yards. The strand of quickmatch used to ignite the delay train was broken during the launching and failed to ignite the delay train. The burster charge was, of course, not ignited.

The third unit of this series was a long range model designed to travel from 2000 to 2500 yards. When fired, all the motor tubes were blown out, together with the section of the head piece between and surrounded by the tubes, commonly called the "star". Since the motor tubes in this unit were the thick wall variety and the nozzles were all steel, it was concluded that failure was probably caused by a combination of pressure and setback force.

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The fourth unit in this series performed in the same manner as the third and failed for the same reasons.

The final series of shots conducted during the month of March consisted of three units made up in the same way as units three and four of the previous series except for the fact that the nozzles were opened up from 0.406" throat diameter to 0.437" diameter. This was calculated to reduce the peak pressure thereby reducing the initial velocity and subsequent strength requirements on the head plate. No effort was made to reduce the weight of the motor tubes since thin walled tubes of one inch outside diameter were not yet available.

Upon firing, each of these three units failed for the same reason. All six bolts holding the head and cap together broke. These failures were also probably due to a combination of pressure and setback force. It was concluded from these tests that lighter tubes and nozzles were required as well as more or stronger bolts.

Plans For Future Work:

Additional revision in design will be made in order to acquire mechanical strength necessary to fire units to the longer ranges.

Financial Status:

Total Amount of Contract (Phase I)

Expenditures During March 1955

Total Expenditures to 31 March 1955

Total Unexpended Balance

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was due to addition of overhead charges recalculated at current overhead rates.

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Expiration Date of Phase I - 1 May 1955

*Entered
5/5/55*

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